	Inches.
February, 1909:	
Cloverdale	5.38
Delta	6.89
Magalia	7.88
Mono Ranch	7.00
Santa Margarita	5.30
Sisson	7.83
Lytle Creek	5.16
March, 1909, Lytle Creek	5.52
November, 1909:	
Blue Canon	5.00
Cisco	5.05
Monumental	9.60
December, 1909:	
Rialto	6.70
Santa Margarita	7.70
Summerdale	7.62
January, 1910, Lytle Creek	5.50
January, 1911:	
Branscomb	6.85
Brush Creek	6.02
Camptonville	6.27
Los Gatos	6.15
Magalia	6.80
Nevada City	6.10
Nimshew	5.28
Santa Barbara	5.09
Squirrel Inn	5.85
Summerdale	6.43
Ben Lomond	7.15
Glenn Ranch	6.28
Glenn Ranch	6.14
Laurel	7.50
Laytonville	6.83
Lick Observatory	9.19
Lick Observatory	5.56
West Branch	5.19
March, 1911:	
Mono Ranch	7.90
San Luis Obispo	5.98
Sierra Madre	5.14
Stirling City	5.85

Mr. John Pettee states that on December 20–21, 1866, he measured the rainfall in San Francisco, as follows:

Time.	Date.	Inches.	Inches per hour.
11.30 a. m. to 4.45 p. m.	Dec. 20	1.97	0.37
4.45 p. m. to 7.45 p. m.	...do....	2.27	.76
7.45 p. m. to 9.50 p. m.	...do....	.85	.41
9.50 p. m. to 1.00 a. m.	Dec. 21	1.20	.39
1.00 a. m to 8.15 a. m.	...do....	1.47	.20
Total		7.76	.37

The reason for many measurements was that the gage held only about 2.50 inches.

MINIMUM TEMPERATURE ON MOUNT WHITNEY, CAL.

By A. G. McADIE.

Maximum and mimimum thermometers were placed in a small shelter on the north wall of the observatory on Mount Whitney, elevation 14,502 feet, in September, 1909. On May 24, 1910, Mr. G. F. Marsh, cooperative observer, succeeded in reaching the summit and found the instruments in the condition in which they were left. The minimum temperature was −23° F. and the maximum temperature 55° F.

In a Monthly Weather Review for May, 1910, the writer called attention to this reading as fairly representing the lowest temperature of that winter at the highest point in the United States proper. Lower temperatures were recorded in California during this same period. For example, −30° F. at Alturas on January 3, 1909, elevation 4,460 feet, and −29° F. at Tamarack, elevation 8,000 feet, January 5, 1909.

On September 26, 1912, the instruments were reset. Mr. F. H. Criss, who read the instruments, states that minimum thermometer No. 1270 indicated a temperature of −35° F. The maximum temperature was 65° F.

It may be stated that in the Sierra, just north of Lake Tahoe, temperatures as low as −30° F. (−34° C.) have occurred. During the winter of 1898 a minimum thermometer exposed on one of the high Sierra peaks recorded −17° F. During the same period the temperature at Bodie fell to −30° F.

The following low temperatures were reported during 1911:

	Elevation.	Temperature.	Date.
	Feet.	°F.	
Sierraville	5,000	−30	Feb. 16
Tamarack	8,000	−26	Dec. 30
Madeline	5,270	−24	Jan. 22
Truckee	5,819	−22	Feb. 26
Alturas	4,460	−21	Dec. 23

During 1912, Alturas, −26° F., January 3; Sierraville, −23° F., January 3.

BEAR VALLEY HYDROELECTRIC DEVELOPMENT, CALIFORNIA.

By JAMES H. WISE.[1]

The hydroelectric project on the south fork of the Yuba and Bear Rivers has been in contemplation for some time, but active work was not begun until permission was received from the railroad commission on July 3, 1912, by the Pacific Gas & Electric Co.

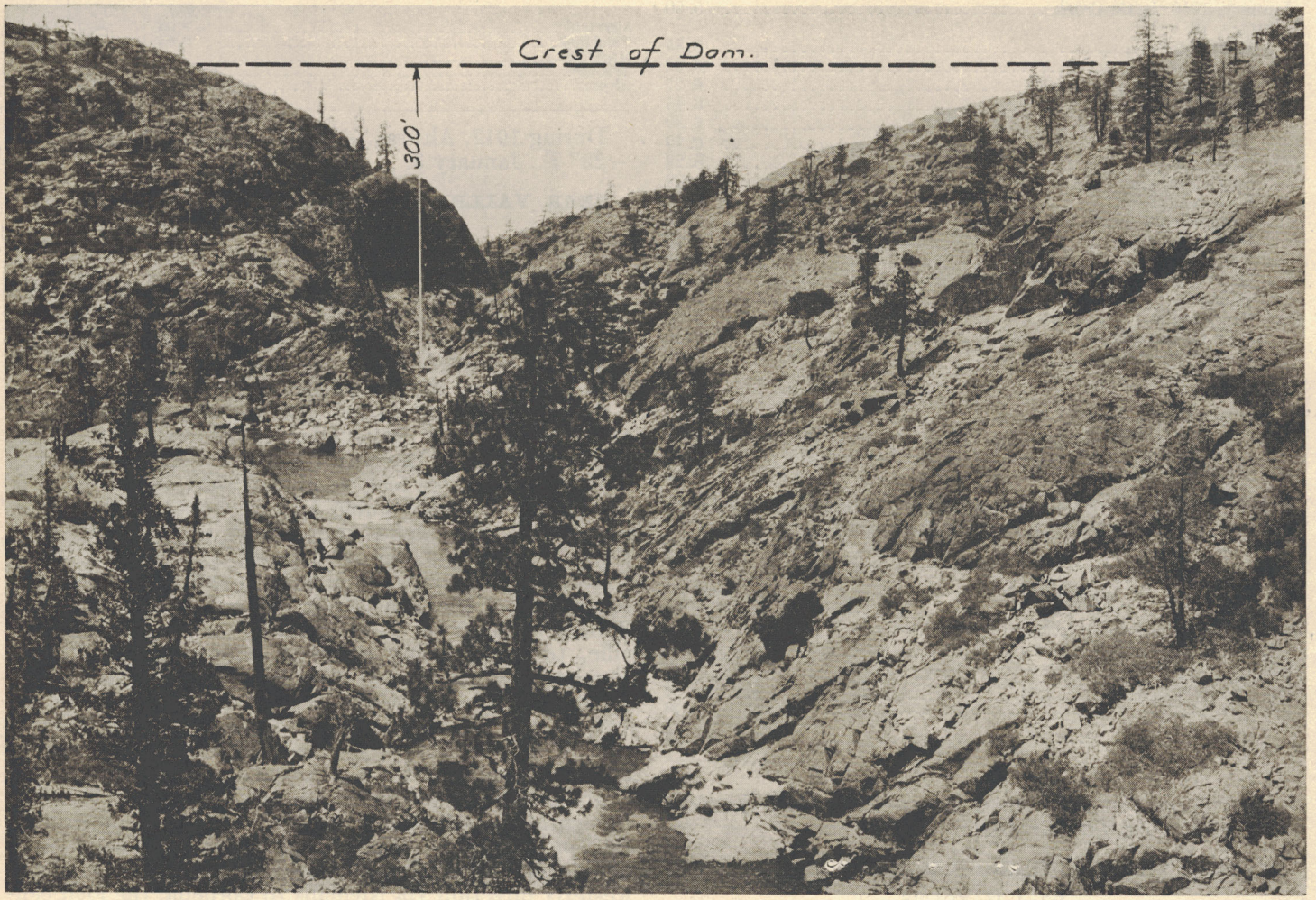
The development makes use for power purposes of the water already impounded in 20 reservoirs in the catchment area of the South Yuba, having a capacity of 2,024,000,000 cubic feet, combined with additional storage of 4,000,000,000 cubic feet, to be secured at Lake Spaulding. The water thus stored is to be diverted, together with the natural run-off, to the Bear River watershed, conducting it in tunnels and canals along the south side of the Bear River Canyon to a point about 3 miles northeast of Towle Station, on the Southern Pacific, to a regulating reservoir known as the "Drum Forebay." Two riveted steel pipe lines will lead from this reservoir to the power house, 1,350 feet lower in elevation, and situated on Bear River, where an installation of 40,000 kilowatts, consisting of 4 units, will be erected, together with the necessary transformers, exciters, governors, and other adequate equipment to make the entire installation complete. Electric power from this plant will be transmitted at 115,000 volts on a double circuit, steel-tower line, extending in a southwesterly direction via Nicolaus to Cordelia, the load center of the Pacific Gas & Electric Co. At this point stepdown transformers will be used for reducing the pressure to approximately 60,000 volts, permitting the power thus to be transmitted to various parts of the system: Oakland, Berkeley, Alameda, San Rafael, Santa Rosa, Vallejo, Petaluma, and northward toward Suisun, Cement, Woodland, Sacramento, Davis, Dixon, and, in fact, to any part of the vast territory already covered by the 60,000-volt network of transmission lines.

The project further includes the construction of a steel-tower line from Cordelia to San Rafael, Sausalito, and Lime Point, thus providing Pacific service to the Marin Peninsula and the transmission of hydroelectric power ultimately to San Francisco.

Adverting to Lake Spaulding, this splendid reservoir site, with a capacity of 4,000,000,000 cubic feet, or nearly double the combined capacity of all of the reservoirs in

[1] Assistant general manager Pacific Gas & Electric Co.

the South Yuba system, will be formed by the construction of a huge monolith of cyclopean concrete. The dam will be of gravity type section, arched upstream for an additional factor of safety and a more substantial type of construction, thus insuring stability and absolute security against any possible failure. The dam will be 300 feet in height and will be built somewhat similar to the New Croton and Croton Falls Dams of the New York water supply, and of cross section, approximating the Roosevelt Dam, which impounds such a vast quantity of water for the Salt River project, a part of the reclamation work of the United States Government. The reservoir is situated about 2 miles northeast of Smart Station, on the Southern Pacific Railroad, at an elevation of 4,600 feet. The proximity of the site to the main line of the Southern Pacific is indeed fortunate and a spur track directly to the location of the dam will greatly facilitate and economize the work. This track has already been constructed and work on the cableways, sand and gravel bunkers, and tunnel outlet is now rapidly progressing.



View of the Spaulding Dam site from upstream, showing the elevation to be reached by the waters of the lake.

In connection with this work at Lake Spaulding not the least important is the operation of the old Birce & Smart sawmill, now owned by the Pacific Gas & Electric Co. The high dam will flood 700 acres of land, which now contains over 1,000,000 board feet of standing timber which the mill has been converting into ties, boards, and dimension stuff at the rate of from twenty to thirty thousand board feet of lumber per day. There is already a good stock of lumber on hand for the work as it progresses. The clearing of the reservoir site will therefore be practically completed and, at the same time, a most valuable use of the timber will be made. Any surplus will be used in the maintenance and repairs of the many flumes on the South Yuba system. A solid rock, concrete-lined tunnel, 4,427 feet long, will form the reservoir outlet and will conduct the water to the upper end of a concrete-lined canal 8½ miles in length, having a capacity of 400 second-feet, or 16,000 miner's inches. This canal will contain no flumes, but will have a short siphon near the lower end leading to the forebay previously mentioned. The regulating reservoir site is a large flat area capable of being converted into a forebay of 400 acre-feet capacity without excessive cost, and will thus provide sufficient water to run the entire plant for 24 hours, and will amply provide for peak load and other power fluctuations—a most valuable adjunct to a plant of this size and importance.

The forebay will be constructed by excavating the earth and loose material from the basin, forming a dam about 35 feet in height on the south or lower side of the slope. The earth embankment will be made according to the most approved methods, namely, by placing the material in thin layers, thoroughly dampening, rolling, and compacting, thus making the dam absolutely imper-

vious. Two riveted steel pipe lines leading from this regulating reservoir will be 6,300 feet long and 72 inches in diameter at the upper end. The lower end will be provided with Y branches, castings, and suitable gates and nozzles for conducting the water to the eight water wheels, each with a capacity of 9,000 horsepower. The pressure at the nozzle of the 7-inch stream impinging upon the water-wheel buckets will be 585 pounds per square inch, or nearly three times the high-steam pressure used by the big locomotives of the Southern Pacific Co.

That this work, both in the field and office, is most actively carried on is shown by the fact that the plans and specifications of the water wheels, generators, transformers, steel towers, and pipe lines are already in the hands of the manufacturers. Excavation for the power-house foundations began immediately upon securing the necessary permission from the railroad commission, and camps were established along the canal line from the Lake Spaulding Dam to the forebay. At the power-house sites at this time 1,400 men are busily engaged in clearing, excavating, and carrying on the many phases of work necessary to a project of this kind, while the engineers of the company have been for months preparing all necessary details, plans, and specifications for each and every individual part of the equipment for the necessary prosecution and construction of the work, as well as the large units which will be used in the final operation of the completed plant. The canal line for its entire length has already been cleared of all brush and trees, and excavation is actively in progress. The forebay site has been cleared of all loose material and objectionable surface earth which could not be used in the main body of the embankment, and some 300 head of stock and 150 men are now actively carrying on the excavating and placing of the earth for the embankment.

Preliminary and final surveys and many of the rights of way have been already secured for the 118-mile transmission line from the Drum power house to Cordelia, and work on the foundations for this line will begin within a few weeks, so that the towers can be installed, assembled, and erected in the early spring of 1913, thus insuring and guaranteeing completion of the line before the fall of next year, which will witness without doubt the final completion of the entire project.

THE SPAULDING DAM OF THE BEAR VALLEY HYDRO-ELECTRIC DEVELOPMENT, CALIFORNIA.

By HERMANN SCHUSSLER.

The dam will be located a short distance downstream from Lake Spaulding, and, owing to its contemplated height of 300 feet above the bed of the river, the original reservoir will be entirely submerged. While the length of the proposed dam will be only 60 feet at the bottom of the gorge, its length along the finished curved top will be 900 feet.

Looking toward the Spaulding Dam site from upstream.

The reservoir to be created by the erection of the new dam will have a surface area of about 700 acres and a storage capacity of 4,000,000,000 cubic feet, or 30,000,000,000 gallons.

The watershed directly tributary to the reservoir has an area of fully 120 square miles, with an average annual rainfall of between 60 and 70 inches.

Owing to the generally rocky and precipitous character of the watershed, the percentage which the seasonal surface run-off bears to the gross precipitation on the watershed will be fully 50 per cent.

Thus, the average annual water product discharging from the above watershed into the proposed new Lake Spaulding will be equal to fully 8,000,000,000 cubic feet, or 60,000,000,000 gallons, or double the storage capacity of the proposed reservoir.